DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Scheme of Instruction and Syllabus of

B.E. (ELECTRONICS AND COMMUNICATION ENGINEERING)

(I & II SEMESTER)

2026-2027

UNIVERSITY COLLEGE OF ENGINEERING
(Autonomous)
Osmania University
Hyderabad – 500 007, TS, INDIA

INSTITUTION

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve society by developing a modern technology in students heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

To achieve excellence in Teaching and Research
To generate, disseminate and preserve knowledge
To enable empowerment through knowledge and information
Advancement of knowledge in Engineering, Science and Technology
Promote learning in free thinking and innovative environment
Cultivate skills, attitudes to promote knowledge creation
Rendering socially relevant technical services to the community
To impart new skills of technology development
To inculcate entrepreneurial talents and technology appreciation programmes
Technology transfer and incubation

DEPARTMENT

Vision

To be in the forefront of advances in Electronics and Communication Engineering education and research to guide and motivate young engineers to face future technological challenges.

Mission

To inculcate analysis and design for innovative problems in the field of Electronics and Communication Engineering with the help of state of art curricula.
To impart practical training to face real life case studies and inter-disciplinary simple solutions to complex problems.
To make engineering education an enjoyable learning experience through challenging tutorials, mini-projects, assignments and laboratory exercises.
To build project team spirit for professional working environment with high ethical values
To develop overall character that will care for society and concerned for the nation through extra-curricular activities.

Programme Educational Objectives (PEO):

PEO1: To educate students with analytical and design skills in Electronics and Communication Engineering applicable to Industries, R&D labs and Institutions involving Space Communications and Defense Electronics etc.

PEO2: To strengthen the basic knowledge in mathematical science and applied science with orientation in engineering applications.

PEO3: To develop overall personality and character with team spirit, professionalism, integrity, moral and ethical values with the support of humanities, social sciences and physical educational courses.

PEO4: To equip the students with laboratory training leading to solving real life practical Problems and project analysis of Electronics and Communication Engineering through case-studies, seminars, Mini projects, internships and main projects.

PROGRAM OUTCOMES (POs)

POs	Engineering Graduates will be able to:
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**Engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	**Analytical Skill:** Ability to plan, execute, manage and rehabilitate Electronics and Communication Engineering systems and processes.
PSO2	**Entrepreneurial Skill:** Ability to become independent designers, consultants and entrepreneurs in the field of ECE.

SCHEME OF INSTRUCTION AND EXAMINATION
B. E.-ECE

I – Semester

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	MC100HS	Induction Program	3weeks							
2	BS101MT	Matrices and Calculus	3	-	-	3	3	40	60	3
3	BS101PH	Engineering Physics	3	-	-	3	3	40	60	3
4	ES101CS	Programming for Problem Solving	3	-	-	3	3	40	60	3
5	ES101EE	Basic Electrical Engineering	3	-	-	3	3	40	60	3
6	PC101EC	Python Programming	3	-	-	3	3	40	60	3
Practicals										
7	BS151PH	Engineering Physics Lab	-	-	3	3	3	25	50	1.5
8	ES151CS	Programming for Problem Solving Lab	-	-	3	3	3	25	50	1.5
9	ES151EE	Basic Electrical Engineering Lab	-	-	3	3	3	25	50	1.5
		Total	**15**		**09**	**25**	**24**	**275**	**450**	**19.5**

SEMESTER I

BS101MT	MATRICES AND CALCULUS						
Prerequisite: Mathematical Knowledge of 12th/ Intermediate level	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	-	-	3	40	60	3

Course Objectives:

- To study Matrices as vector spaces, subspaces, linear transformation and its use in solving system of linear equations.
- To study Eigenvalue problems, Diagonalizable Matrices and Quadratic Forms.
- To introduce the concepts of Functions of Several Variables and its Applications.
- To introduce the concepts of Multiple Integrals and its Applications.
- To study Vector Differential and Integral Calculus.

Course Outcomes: After completion of this course, the students will be able to:

1. Find vector spaces and subspaces and solutions of system of linear equations.
2. Solve Eigenvalue problems, Similar & Diagonalizable Matrices and Canonical Form of Quadratic Forms
3. Find the maximum and minimum values of multiple variable functions.
4. Use the knowledge of Multiple Integrals in finding the area and volume of any region bounded by given curves
5. Apply the knowledge of Vector Calculus to find line, surface and volume integrals.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	-	-	1	-	-	2	-	-
CO2	3	2	1	2	2	2	-	-	1	-	-	2	-	-
CO3	3	2	2	3	2	2	-	-	1	-	-	2	-	-
CO4	3	2	1	1	1	2	-	-	1	-	-	2	-	-
CO5	3	2	2	3	1	2	-	-	1	-	-	2	-	-

UNIT - I

Matrices and Vector Spaces: Vector Spaces, Subspaces, Linear Independence of Vectors, Dimension and Basis, Linear Transformation, Solution of General linear System of Equations, Elementary row and Column Operations, Echelon form of a Matrix, Gauss Elimination Method for Non-Homogeneous Systems, Homogeneous System of Linear Equations.

UNIT - II

Eigenvalue Problems: Eigenvalues and Eigenvectors, Cayley - Hamilton theorem (without Proof), Similar and Diagonalizable Matrices, Special Matrices, Quadratic Forms, Canonical Form of a Quadratic Form.

UNIT - III

Functions of Several Real Variables: Introduction, Functions of Two Variables, Limits, Continuity, Partial Derivatives, Total Differential and Differentiability, Derivatives of Composite and Implicit Functions, Higher Order Partial Derivatives, Homogeneous functions, Taylor's Theorem (without Proof), Maximum and Minimum Values of Function, Lagrange's Method of Multipliers.

UNIT - IV

Multiple Integrals: Double Integrals, Evaluation of double integrals by two successive integrations, Application of double integrals, Triple Integrals, Application of triple integrals, Evaluation of triple Integrals, Change of Variables in Integrals.

UNIT - V

Vector Differential and Integral Calculus: Gradient of a Scalar Field and Directional Derivative, Divergence and Curl of a Vector Field, Line Integrals, Line Integrals Independent of the Path and Green's Theorem (without Proof), Surface Integral, Divergence Theorem of Gauss and Stoke's Theorem (without Proof).

Suggested Reading:

1. R. K. Jain & S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition 2016 (Fifteenth Reprint 2026).
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley publications, 11thEdition, 2025.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 45rd Edition, 2024(Reprint 2025).
4. N.P. Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, 11th Edition, 2025.
5. H. K. Dass and Er. Rajnish Varma, Higher Engineering Mathematics, S. Chand Publications 3rd Revised Edition 2014(Reprint 2025).

e - resources: https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma133

BS 101 PH	ENGINEERING PHYSICS						
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- To understand the fundamental laws of electromagnetism and how they lead static and time-varying electric and magnetic fields and to apply wave theory to optical phenomena, such as interference, diffraction, and polarization
- To appraise significance of stimulated emission and laser light production. Subsequently propagation of light through optical fibers.
- To make students understand the formation of energy bands and classification of the solids based on the band theory and to sensitize the students towards nanomaterials.
- To understand the different types Magnetic materials and Dielectric materials with their origin of evolution.
- To understand Schrodinger's wave equation and its applications and to understand the concept of superconductors.

Course Outcomes: After completion of this course, the students will be able to:

1. know how electric and magnetic fields lead the behavior of electromagnetic wave. It bridges classical physics and modern optics, empowering learners to analyze complex electromagnetic systems and waves optics.
2. understand the construction and working of different laser systems and apply them to propagate light through optical fiber cable as cutting edge application.
3. understand the semiconducting materials and their properties, operating electronic devices, and applying them in circuits and also equips students with the fundamental principles, how materials behave at the nanoscale and how these unique physical, chemical, and biological properties differ from bulk materials.
4. understand the fundamental physics behind how materials interact with electric and magnetic fields.
5. enrich and understand the implications of matter waves in quantum mechanics evolution and to equip students with the theoretical skills to analyze and apply materials that conduct electricity with zero resistance and expel magnetic fields.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	3	-	-	-	-	-	3	3	-
CO2	3	2	3	2	3	3	-	-	-	-	-	3	3	3
CO3	3	2	3	2	3	3	-	-	-	-	-	3	3	2
CO4	3	2	1	2	1	3	-	-	-	-	-	3	3	-
CO5	3	2	3	2	3	3	-	-	-	-	-	3	3	2

UNIT – I

Modern Optics: Interference – Newton's Rings by reflected light – Experimental arrangement – Types of diffraction – Diffraction due to single slit - Diffraction due to double slit (qualitative)-diffraction grating (Conditions of maxima and minima) – Polarization – Malus law – Double refraction – Nicol's Prism. – Optical activity and polarimeter.

Electro Magnetic Theory: Basic laws of electricity and magnetism – Derivation of Maxwell's equations in integral and differential forms - Conduction and displacement current – modification of Ampere's law - - Equation of plane wave in free space – Poynting theorem.

UNIT - II

Lasers: Characteristics of lasers – Absorption of radiation, spontaneous and stimulated emission of radiation - Einstein's coefficients and their relation - Population inversion– Types of lasers - Ruby laser, Helium-Neon laser and Semiconductor laser – Applications of lasers.

Fiber Optics: Construction of an optical fiber – Propagation of light through an optical fiber - Acceptance angle - Numerical aperture – Types of optical fibers (Based on number of modes and refractive index profile) – Fiber drawing process (double crucible method) - Applications of optical fibers.

UNIT - III

Quantum Mechanics: Schrödinger's time independent and time dependent wave equation – Physical significance of wave function – Particle in 1-D box – Wave function, Probability function – Quantum states – Introduction to quantum technology and applications.

Semiconductor Physics: Classification of materials based on band theory - Kronig-Penney model (qualitative treatment) - Energy band formation in solids - Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode, Light Emitting Diode and their I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

UNIT - IV

Dielectric Materials: Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium Titanate – Piezo electricity – Super capacitor.

Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio – Quantum confinement effect – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (e.g., Sol Gel method and Chemical Vapor Deposition method), Top-down methods (e.g., Ball milling method) - Basic ideas of carbon nanotubes – Applications of nanomaterials and their health hazards.

UNIT – V

Magnetic Materials: Origin of magnetism (Orbital and Spin magnetic moments) - Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials – Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials. Ferrites: Applications of ferrites.

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High T_c superconductors - Applications of superconductors.

Suggested Reading:

1. M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2. C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3. R.K. Gour and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications.
4. B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.
5. A.K Bhandhopadhya - Nano Materials, New Age International.

ES 101 CS	PROGRAMMING FOR PROBLEM SOLVING					
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation	Credits
	L	T	P		CIE	SEE
	3	-	-	3	40	60	3

Course Objectives:

- To introduce the basic concepts of Computing environment, number systems and flowcharts
- To familiarize the basic constructs of C language – data types, operators and expressions
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types and memory management using pointers
- To learn the concepts of data handling using files

Course Outcomes: After completion of this course, the students will be able to:

1. Explain various functional components in computing environment
2. Develop algorithmic solutions to problems and draw the flow charts
3. Explain and use basic constructs of C in writing simple programs
4. Use standard library functions in C and develop modular programs using user defined functions and structured data types
5. Use files and file handling for applications.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	1	-	-	-	1	-	1	-	2	2
CO2	3	3	2	-	1	-	-	-	1	-	1	-	2	2
CO3	3	2	2	-	2	-	-	-	-	-	1	-	2	2
CO4	3	3	3	1	2	-	-	-	1	-	1	-	2	2
CO5	2	2	3	1	3	-	-	-	1	-	1	-	2	2

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts**.** Number Systems: Binary, Octal, Decimal, And Hexadecimal.

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements, Arithmetic Operators and Expressions**:** Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT – II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and

Go to statements. Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard

Functions, Methods of Parameter Passing. Recursion- Recursive Functions. **Storage Classes**: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers

UNIT– III

Preprocessors: Preprocessor Commands.

Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT – IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L - value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions

UNIT –V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, “A Structured Programming Approach in C” , Cengage Learning, 2007
2. Kernighan BW and Ritchie DM, “The C Programming Language”, 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, “The Fundamentals of Computer”, 4th Edition, Prentice-Hall of India, 2006.
4. Dromey “How to Solve it by Computer, Pearson education, 2006

ES 101 EE	BASIC ELECTRICAL ENGINEERING						
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- To understand the fundamentals of DC electrical circuits.
- To understand the fundamentals of AC electrical circuits
- To understand the working principles of Transformers
- To understand the working principles of DC motor and DC generator
- To understand working principles of protection devices used in electrical circuits.

Course Outcomes: After completion of this course, the students will be able to:

1. Analyze the performance of simple electrical circuits & apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power. and AC excitations.
2. Analyze the performance of simple electrical circuits exciting with DC
3. understand the working principles of Transformers and AC Motors
4. Understand the main components, characteristics, applications of different DC and AC electrical machines used in industry.
5. Understand the importance of protective devices and their rating used in electrical circuits. Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	2	-	-	1	-	-	-	-	-	-	2	3
CO4	3	2	2	-	-	2	-	-	-	-	-	-	2	3
CO5	3	2	1	-	-	2	-	-	-	-	-	-	2	3

UNIT – I : DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Ohm`s Law, KCL and KVL, series, parallel circuits, analysis of simple circuits with dc excitation. Thevenin`s, Norton`s & Superposition Theorems.

UNIT - II : AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - III: Transformers

Transformers: Electromagnetic induction, Faradays laws, statically induced EMF, EMF equation, ideal and practical transformer, OC & SC tests, losses and efficiency, Auto-transformer and three-phase transformer connections.

AC Motors: Induction Motors and BLDC Motors, Principle of operation, Advantages and Applications.

UNIT IV: - DC Machines

DC Generators: Dynamically induced emf, construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications.

DC Motors: Principle of working, Torque expression**,** Types of DC Motors, characteristics, applications.

UNIT - V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing & types of Earthing. Elementary calculations for energy consumption, power factor improvement by capacitors.

Suggested Reading:

1 J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.

2 J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications, 2010.

3 V.N.Mittle, Aravind Mittal "Basic Electrical Engineering" *Tata Mc.Graw Hill Publicationss* second edition2007.

4 Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.

5. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar C handa, "Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009

ES 101 EC	PYTHON PROGRAMMING						
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- Acquire programming skills in core Python.
- Acquire Object-oriented programming skills in Python.
- Develop the skill of designing graphical-user interfaces (GUI) in Python.
- Develop the ability to write database applications in Python.
- Acquire Python programming skills to work into various Specializations such as Data Science, Machine Learning, Artificial Intelligence etc.

Course Outcomes: After completion of this course, the students will be able to**:**

1. Develop Python programs with conditional statements and loops.
2. Write programs using functions, strings and lists
3. Construct Python data structures programs using tuples, dictionaries
4. Write programs using files, OOPS concept, regular expressions
5. To perform transactions using database.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2
CO2	-	2	3	-	2	-	-	-	-	-	-	2	2	2
CO3	-	-	-	3	2	-	-	-	-	-	-	2	2	2
CO4	-	-	2	-	2	-	-	-	-	-	-	2	2	2
CO5	-	-	2	-	2	-	-	-	-	-	-	2	2	2

UNIT–I

INTRODUCTION TO PYTHON: Introduction to Python: Features of Python, History and Future of Python, Working with Python – interactive and script mode, Identifiers and Keywords, Comments, Indentation and Multi-lining, Data types – built-in data types, Operators and Expressions, Console Input/Output, Formatted printing, Built-in Functions, Library Functions**.**

UNIT–II

DECISION CONTROL STATEMENTS: Selection/Conditional Branching Statements: if, if-else, nested if, if-else-if-else statement(s), Basic Loop Structures/ Iterative Statements – while and for loop, Nested loops, break and continue statement, pass Statement, else Statement used with loops.

UNIT–III

CONTAINER DATA TYPES: Lists: Accessing List elements, List operations, List methods, List comprehension; Tuples: Accessing Tuple elements, Tuple operations, Tuple methods, Tuple comprehension, Conversion of List comprehension to Tuple, Iterators and Iterables, zip() function. Sets: Accessing Set elements, Set operations, Set functions, Set comprehension; Dictionaries: Accessing Dictionary elements, Dictionary operations, Dictionary Functions, Nested Dictionary, Dictionary comprehension

UNIT-IV

STRINGS AND FUNCTIONS: Strings: Accessing String elements, String properties, String operations. Functions: Communicating with functions, Variable Scope and lifetime, return statement, Types of arguments, Lambda functions, Recursive functions.

UNIT – V

CLASSES AND OBJECTS: Classes and Objects – Defining Classes, Creating Objects, Data Abstraction and Hiding through Classes, Class Method and self-Argument, Class variables and Object variables, init() and del () method, Public and private data members, Built-in Class Attributes, Garbage Collection. OOPs Features: Abstraction, Encapsulation, Inheritance, and Polymorphism.

Suggested Reading:

1. Reema Thareja, “Python Programming - Using Problem Solving Approach”, Oxford Press, 1st Edition, 2017.
2. Dusty Philips, “Python 3 Object Oriented Programming”, PACKT Publishing, 2nd Edition, 2015.
3. Yashvant Kanetkar, Aditya Kanetkar, “Let Us Python”, BPB Publications, 2nd Edition, 2019.
4. Martin C. Brown, “Python: The Complete Reference”, Mc. Graw Hill, Indian Edition, 2018.
5. R Nageswar Rao, “Core Python Programming”, Dreamtech Press, 2018.

BS 151 PH	ENGINEERING PHYSICS LAB					
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation	Credits
	L	T	P		CIE	SEE
	-	-	3	3	25	50	1.5

Course Objectives:

- To provide practical, experimental verification of fundamental physics concepts learned in lectures.
- To familiarize students with the operation, calibration, and maintenance of modern laboratory equipment and electronic measuring devices such as Four probe setups, Hall effect setup, polarimeters, diodes, lasers, spectrometers, and multimeters.
- To develop analytical and critical thinking skills. Students learn how to accurately record observations, perform graphical data analysis, apply experimental statistics, and estimate % of error and measurement precision.
- To estimate and evaluate the physical properties of engineering materials and components (e.g., determining energy gap in semiconductors, magnetic hysteresis or dielectric constants).
- To train students in the proper execution and documentation of scientific inquiry. This involves constructing proper experimental setups, drawing valid conclusions from collected data, and accurately maintaining laboratory records.

Course Outcomes: After completion of this course, the students will be able to:

1. correlate theoretical physics concepts with real-world observations.
2. design experimental setups, conduct measurements, and compare your practical findings with theoretical models or calculations.
3. gain expertise in handling advanced lab instruments (e.g., spectrometers, four-probe setups, and lasers etc.). This includes an understanding of instrument sensitivity, targeted accuracy, and error analysis.
4. train the students in meticulous data recording, graphical representation, and logical deduction.
5. identify discrepancies between expected and measured values and draw evidence-based conclusions.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	2	1	3	1	-	-	-	-	-	-	3	3
CO5	3	1	-	-	-	-	-	-	-	-	-	-	3	1

List of Experiments:

1. To Estimate Radius of curvature of given lens by forming Newton's rings.
2. To determine specific rotatory power of a given solution by using Laurent's Half shade polarimeter.
3. To determine the wavelength of prominent spectral lines of mercury vapour lamp by plane diffraction grating with the help of spectrometer by using Normal Incidence Method.
4. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT)/Barium Titanate ($BaTiO_3$).
5. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron), and find out (a) Coercivity, (b) Retentivity and (c) Hysteresis loss.
6. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
7. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
8. To study V-I characteristics of Light Emitting Diode.
9. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
10. To calculate the Numerical aperture (NA), acceptance angle of a given optical fiber.
11. Determination of wavelength of LASER using diffraction grating.
12. To determine the constants of A, B and α of given Thermistor.

Suggested Reading:

1. M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2. C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3. R.K. Gour and S.L. Gupta Engg. Physics, Dhanpat Rai Publications.
4. B.K. Pandey and S.Chaturvedi Engineering Physics, Cengage Learning.
5. A.K Bhandhopadhya - Nano Materials, New Age International.

ES151CS	PROGRAMMING FOR PROBLEM SOLVING LAB						
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	3	3	25	50	1.5

Course Objectives:

- To use tools available under LINUX for C programming
- To gain hands-on experience on basic constructs of C programming
- To formulate problems and implement algorithmic solutions in C
- To write modular programs in C using structure programming techniques and data files.
- To gain hands-on experience in using Python Programming constructs.

Course Outcomes: After completion of this course, the students will be able to:

1. Write, compile and debug C programs in Linux environment
2. Write simple programs using control structures, user defined functions and data manipulation using arrays
3. Use standard C library functions to develop modular programs in C
4. Write basic Python Programs, using conceptual understanding of Programming.
5. Create Programs, solutions for any problem statements with Programmatic, logic based approach.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	-	3	-	-	-	-	-	1	-	2	2
CO2	3	3	2	-	2	-	-	-	-	-	1	-	2	2
CO3	3	2	3	-	2	-	-	-	-	-	1	-	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	-	2	2
CO5	3	3	3	2	2	-	-	-	-	-	1	-	2	2

List of Laboratory Experiments:

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa

6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list.
18. Python Basics and Input/Output
    a) Print "Hello, Engineering Students!"
    b) Read two integers and display their sum, difference, product, quotient, and remainder.
    c) Calculate the area and circumference of a circle.
    d) Swap two numbers (with and without a temporary variable).
    e) Convert temperature from Celsius to Fahrenheit.
    f) Calculate simple and compound interest.
19. Develop programs using conditional statements.
    a) Find the largest of three numbers.
    b) Check whether a year is a leap year.
    c) Determine whether a number is positive, negative, or zero.
    d) Check whether a number is even or odd.
    e) Display grades based on marks using if-elif ladder.
    f) Develop a menu-driven calculator using if-elif.
20. Develop programs using loops
    a) Print multiplication table of a given number.
    b) Generate first N Fibonacci numbers.
    c) Find factorial of a number.
    d) Check whether a number is prime.
    e) Reverse a given integer.
    f) Display Armstrong numbers between 1 and 1000.
21. Develop modular Python programs using functions.
    a) Write a function to find the maximum of two numbers.
    b) Write a function to calculate factorial using recursion.
    c) Write a function to check palindrome.
    d) Write a function to compute GCD of two numbers.
    e) Write a function to determine whether a number is prime.
    f) Create a menu-driven mathematical calculator using functions

22. Lists & Tuples - Perform operations on Python collections.

a) Read N numbers into a list and find the largest and smallest.
b) Compute average and median of list elements.
c) Remove duplicate elements from a list.
d) Sort a list in ascending and descending order.
e) Search an element using linear search.
f) Count frequency of each element in a list.

23. Develop programs using dictionaries.

a) Create a student dictionary containing Roll Number, Name, Branch, and CGPA.
b) Count frequency of characters in a string.
c) Count frequency of words in a paragraph.
d) Create a telephone directory using a dictionary.
e) Implement a simple student record management system using dictionaries.
f) Find the student with the highest marks from a dictionary of student names and marks.

ES 151 EE	BASIC ELECTRICAL ENGINEERING LAB						
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
		-	3	3	25	50	1.5

Course Objectives:

- To understand the fundamentals of DC and AC electrical circuits.
- To Analyze the balanced three phase circuits to obtain the current,voltage and power.
- To understand the working principles of Transformers and three phase transformer connections
- To understand the working and performance characteristics of DC Motors
- To understand the Magnetization characteristics of DC Generators.

Course Outcomes: After completion of this course, the students will be able to:

1. Get an exposure to common electrical components and their ratings.
2. To Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Analyze the performance of AC and DC circuits with appropriate operating conditions.
5. Understand the basic operation and characteristics of transformers and electrical machines.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	3	3

List of Laboratory Experiments/Demonstrations:

I - Cycle

Demonstration: Basic safety and precautions - Introduction and use of measuring instruments, characteristics of machines: DC machine, and three phase transformer connections.

1. Verification of Kirchhoff's Laws
2. Verification of Thevenin's & Norton's Theorems

3. Verification of superposition Theorem
4. Sinusoidal steady state response of series R-L-C circuits-impedance calculation and verification
5. Open Circuit &Short Circuit Test on single phase Transformer
6. Steady-state & transient time-response of R-C circuit to a step change in voltage
7. Load test on single phase transformer: Measurement of primary and secondary voltages, currents and power
8. Three-phase Transformer: Star and Delta connections. Voltage and current relationship
9. Performance Characteristics of DC-Shunt Motor
10. Magnetization curve of a separately excited DC Generator

Suggested Reading:

1 J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.

2 J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications, 2010

3 Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009

4 Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.

SCHEME OF INSTRUCTION AND EXAMINATION

II – Semester **B. E. (ECE)**

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	BS201MT	Differential Equations and Fourier Series	3	-	-	3	3	40	60	3
2	BS201CH	Engineering Chemistry	3	-	-	3	3	40	60	3
3	HS201EG	Communicative English	3	-	-	3	3	40	60	3
4	BS201EC	Semiconductor Devices and Circuits	3	-	-	3	3	40	60	3
5	ES201EC	Data Structures using C	3	-	-	3	3	40	60	3
Practicals										
6	BS251CH	Engineering Chemistry Lab	-	-	3	3	3	25	50	1.5
7	HS251EG	Communicative English Lab	-	-	3	3	3	25	50	1.5
8	ES251CE	Engineering Graphics	2	-	4	6	3	25	50	4
9	ES252ME	Workshop Practice	-	-	6	6	3	25	50	3
		Total	**19**	**-**	**13**	**34**	**27**	**300**	**500**	**25**

SEMESTER-II

BS201MT	DIFFERENTIAL EQUATIONS AND FOURIER SERIES						
Prerequisite: Mathematical Knowledge of 12th/ Intermediate level	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	-	-	3	40 Marks	60 Marks	3

Course Objectives:

- To study the ordinary differential equations of first order.
- To study the linear ordinary differential equations of second and higher order with variable and constant coefficients.
- To apply general methodology to solve linear first order and second order partial differential equations.
- To learn about expansion of functions by Fourier series.
- To study the classification of second order partial differential equations and solve them by using separation of variables methods.

Course Outcomes: After completion of this course, the students will be able to:

1. Find the solutions of ordinary differential equations of first order.
2. Find the solutions of linear ordinary differential equations of second and higher order with variable and constant coefficients.
3. Find the solutions of first and second order PDE.
4. Obtain the Fourier series for a given function.
5. Find solutions of the heat equation, wave equation, and the Laplace equation subject to boundary conditions.

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	1	1	-	-	1	-	-	2	2	2
CO2	3	2	1	2	2	2	-	-	1	-	-	2	2	2
CO3	3	2	2	3	2	2	-	-	1	-	-	2	2	2
CO4	3	2	1	1	1	2	-	-	1	-	-	2	2	2
CO5	3	2	2	3	1	2	-	-	1	-	-	2	2	2

UNIT - I

Ordinary Differential Equations of First Order: Exact First Order Differential Equations, Integrating Factors, Linear First Order Equations, Bernoulli Equation, Application of Differential Equations of First Order –Newton's Law of Cooling, Rate of Decay of Radio – Active Materials.

UNIT - II

Linear Differential Equations: Introduction, Solutions of Linear Differential Equations, Linear Independence and Dependence, Methods for Solution of Linear Equations, Differential Operator $\boldsymbol{D}$, Solutions of Second and Higher Order Linear Homogeneous Equations with Constants Coefficients, Method of Reduction of Order for Variable Coefficient Linear Homogeneous Second Order Equations, Solutions of Non- Homogeneous Linear Equations, Method of Variation of Parameters, Solution of Euler – Cauchy Equation, Operator Methods for Finding Particular Integrals Case $\boldsymbol{r(x) = e^{\alpha x}}$, Case $\boldsymbol{r(x) = \cos(\alpha x)\ or\ \sin(\alpha x)}$, Case $\boldsymbol{r(x) = x^{\alpha}, \alpha > 0}$ and integer.

UNIT - III

Partial Differential Equations: Introduction, Formation of First and Second Order Equations, Solution of First Order Equations, Lagrange's Equation, Higher Order Linear Equations with Constant Coefficients.

UNIT - IV

Fourier series: Introduction, Fourier series, Fourier series Expansions of Even and Odd functions, Convergence of Fourier series, Fourier Half - Range Series.

UNIT - V

Application of Fourier series: Classification of Linear Second Order Partial Differential Equations, Separation of Variables Method (Fourier Method) Fourier series Solution of the Heat Equation, Fourier series Solution of the Wave Equation, Fourier series solution of the Laplace Equation.

Suggested Reading:

1. R. K. Jain & S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition 2016 (Fifteenth Reprint 2026).
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley publications, 11thEdition, 2025.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 45rd Edition, 2024(Reprint 2025).
4. N.P. Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, 11th Edition, 2025.
5. H. K. Dass and Er. Rajnish Varma, Higher Engineering Mathematics, S. Chand Publications 3rd Revised Edition 2014(Reprint 2025)

e-resources: https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma98

BS 201 CH	ENGINEERING CHEMISTRY						
Prerequisite: Chemistry Knowledge of 12th	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:

- To understand the fundamentals and principles of water chemistry relevant to Engineering chemistry.
- To acquire knowledge of polymers used for industrial purposes with various applications.
- Interpret spectroscopic data for structural elucidation of molecules.
- Analyze the spontaneity and equilibrium of chemical reactions.
- Apply knowledge of batteries and nano materials to aid in engineering and technical applications**.**

Course Outcomes:

1. Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also teaches the techniques of softening of hard water and treatment of water for drinking purpose. Gains knowledge in causes of corrosion and its prevention.
2. Analyze the basic methods of reaction of organic molecules and study their properties.
3. Distinguishes the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
4. Rationalize bulk properties and processes using thermodynamic considerations.
5. Apply the knowledge of fundamentals of nanoparticles to design nanosystems in every field.

Course Articulation Matrix:

	P01	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	-	-	-	-	-	-	-	-	2	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	2	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	2	-	-	-	-	-	-	-	-	2	3	-

UNIT-I

Water Chemistry and Corrosion

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Water softening by Ion exchange and Reverse Osmosis methods. Boiler

troubles-scales and sludges formation-causes, effects and prevention. Numerical problems.

Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion. Corrosion control methods: Cathodic protection methods- Sacrificial anodic and impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning.

UNIT-II

Reaction Mechanism and Polymers

Reaction Mechanism: Introduction - Addition, Substitution and Elimination reactions. Addition to C=C and C=O, Nucleophilic substitution in aliphatic system: SN^1 and SN^2 mechanism, Elimination reactions: E^1 and E^2 mechanism

Polymers: Introduction, Classification of polymers -Plastics, Fibres and Elastomers.

Preparation, properties and engineering applications of the following polymers:

Plastics: PVC and Bakelite

Fibers: Nylon 6:6, and Dacron.

Elastomers: Buna-S and Butyl Rubber.

Conducting polymers: Introduction. Mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers. Biodegradable polymers, Applications of polymers in concrete materials – Epoxy resins.

UNIT-III

Molecular Structures and Spectroscopy

Molecular Orbital Theory: Linear Combination of Atomic Orbital's (LCAO).Molecular Orbital energy level diagrams of diatomic molecules-O_2, N_2 and NO.

Description of Electromagnetic spectrum.

Principles of UV-Visible Spectroscopy: Statement of Beer-Lambert Law. Chromophores and Auxochromes. Absorption and intensity shifts: Bathochromic, Hypsochromic, Hyper chromic and Hypo chromic shifts with one example each. Principle and applications of UV Sensors.

IR Spectroscopy: Principle of IR Spectroscopy.IR active and IR inactive molecules (two examples each). Types of vibrational bands, Degrees of Freedom for linear and non linear molecule, Principle and applications of IR Sensors.

NMR Spectroscopy: Principle of ^{1}H-NMR Spectroscopy. Multiplicity, Chemical Shift. Example-Ethyl chloride, Principle and Applications of MRI.

UNIT-IV

Thermodynamics and Electro Chemistry

Thermodynamics: Terminology of Thermodynamics, thermodynamic processes, Work done in Reversible isothermal and adiabatic processes, efficiency of heat engine by Carnot cycle, concept of entropy, physical significance of entropy, Work function, Gibbs free energy and their significance, variation of free energy with temperature and pressure, criteria of spontaneity in terms of entropy and free energy-Numericals.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells, cell-notation, cell reaction and cell potentials. Types of electrodes-Calomel, and Glass electrode. Determination of P^H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells-Nernst equation and its derivation. Application of Nernst equation & Numericals. Principles and applications of Conductometric titrations.

UNIT-V

Energy Sources and Nanomaterials

Batteries: Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications.

Fuel cells: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and methanol-Oxygen fuel cells.

Solar cells: Concept of solar energy conversion, photovoltaic cells.

Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials.

Suggested Reading:

1. Jain & Jain, Engineering chemistry, Dhanpat Rai publishing Co., 17th Edition.
2. Shashi Chawla, Textbook of Engineering chemistry. Danpat rai & Co.
3. Arun Bahl and BS Bahl, A textbook of Organic Chemistry, S. Chand Co. Ltd., S. Chand Publishing, 2017.
4. Robert Silverstein spectrometric identifications of organic compounds, Journal of Chemical Education, ACS Publications.
5. L.D.S. Yadav, Organic Spectroscopy. Springer nature-2005.
6. Y.R. Sharma Elementary organic spectroscopy, S.Chand Publications.

HS 201 EG	COMMUNICATIVE ENGLISH					
Prerequisite:	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives

- To develop students listening, speaking, reading, and writing (LSRW) skills for academic and professional communication.
- To enhance vocabulary, grammar, and language accuracy for effective expression.
- To improve comprehension and critical thinking through prose, poetry, biographies, and professional ethics.
- To equip students with technical and professional writing skills such as report writing, email writing, presentations, and resume writing.
- To enable students to communicate confidently and ethically in professional and social environments.

Course Outcomes: After successful completion of the course, students will be able to:

1. Demonstrate effective listening, speaking, reading, and writing skills in academic and professional contexts.
2. Apply appropriate vocabulary, grammar, and language structures to communicate accurately and fluently.
3. Analyze literary and non-literary texts to develop comprehension, critical thinking, and interpretation skills.
4. Prepare professional documents such as reports, emails, letters, resumes, and presentations using appropriate formats and conventions.
5. Demonstrate ethical communication practices and interpersonal skills required for teamwork and professional success.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	3	3	-	2	-	2
CO2	3	2	-	-	-	-	-	-	2	3	-	2	-	2
CO3	2	3	-	-	-	-	-	2	2	2	-	3	-	2
CO4	2	2	-	-	1	-	-	-	2	3	-	2	-	2
CO5	-	2	-	-	-	2	-	3	3	3	-	2	-	2

Unit I

Prose: Silent Crisis | Martha C Nussbaum
Listening: What is Listening; Process of Listening; Importance of Listening
Speaking: Importance of Communication, Types of Communication (Non-verbal and Verbal)
Reading: Importance of Reading
Writing: Features of Writing Composition: Cohesions, Coherence, Precision and Clarity
Vocabulary and Grammar: **Homonyms**; Homophones; Homographs; Punctuation; Sentence Structure (Simple, Compound, Complex)

Unit II

Poem: Where the Mind is Without Fear | Rabrindranath Tagore
Listening: Types of Listening; Non-Verbal and Verbal Signs of Active Listening
Speaking: Types of Communication (Oral, Written, Visual)
Reading: Reading Skills: Skimming, Scanning
Writing: Discourse Markers and Linking Words; Paragraph Writing; Précis Writing
Vocabulary and Grammar: Root Words: Prefix, Suffix; Synonyms; Antonyms; Idioms and Phrasal Verbs; Concord

Unit III

Biography: Homi J. Bhabha | Enakshi Chatterji
Listening: Effective Listening: Principles and Techniques
Speaking: Styles of Communication; Channels of Communication (Vertical, Horizontal, Interpersonal, Grapevine)
Reading: Intensive and Extensive Reading
Writing: Essay Writing; Report Writing
Vocabulary and Grammar: Words Often Confused; Tenses

Unit IV

Prose: A World Made by Atoms | Margaret Cavendish
Listening: Barriers to Effective Listening
Speaking: Barriers to Communication; Johari Window
Reading: SQ3R Method
Writing: Business Communication: Letter Writing; Resume Writing; Email Writing; Etiquette for WhatsApp /other Messaging Services
Vocabulary and Grammar: One-Word Substitutes; Active and Passive; Reported Speech

Unit V

Prose: Professional Ethics
Listening: Note-Taking; Critical Listening Exercises
Speaking: Speaking To Communicate Effectively; Proverb Expansion through JAM
Reading: Critical and Inferential Reading Passages
Writing: Creating Writing
Vocabulary and Grammar: Technical Vocabulary; Common Errors in English; Correct Use of Prepositions and Articles; Avoiding Ambiguity; Misplaced Modifiers; Avoiding Redundancy

Suggested Readings:

1. Ashraf, M. Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2006
2. Language and Life A Skills Approach, Orient Black Swan, 2018
3. Raman, Meenakshi Raman and Sangeetha Sharma. Technical Communication: Principles and Practice. 2nd Edition, Oxford University Press, 2011
4. Swan, Michael, Practical English Usage. Oxford University Press, 1995.

5. Vijaya, B. Communicative English and Employability Skills. Orient Blackswan, 2026.

BS 201 EC	SEMICONDUCTOR DEVICES AND CIRCUITS						CORE
Prerequisites: Engineering Physics	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:

- Study and analyze the behavior of Semiconductor diodes in Forward and Reverse bias
- Analyze half wave and full wave rectifiers with and without filters.
- Demonstrate V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations
- Understand DC Biasing techniques for BJT in Amplifier Applications
- Understand construction and working of FETs and MOSFETs

Course Outcomes: After successful completion of the course, students will be able to:

1. Understand the working and Analyze the characteristics of PN Junction diodes and other special diodes
2. Understand the working of Rectifiers with and without filters.
3. Understand the working and Analyze the characteristics of BJT and design biasing circuits
4. Understand working and Analyze the characteristics of JFET
5. Understand the working and Analyze the characteristics of MOSFET

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	-	-	3	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	1	1	2	-	-	-	3	-	-	-	-	-	2	2

UNIT –I

PN JUNCTION: Qualitative theory of the p-n junction, PN Junction as a diode, forward and Reverse applied Bias, current components in a p-n diode, Volt-Ampere characteristic, Capacitances of the diode, Junction breakdown, Zener Diode working, Voltage regulation using Zener diode. Applications: basic clippers, two level clippers, clamping circuits.

UNIT-II

Power Supplies: Half wave and Full wave rectifiers – their operation, performance characteristics and analysis. Operation of above rectifiers using filters (C and L). Special Diodes: Light Emitting Diode, Photodiode, Varactor Diode, Tunnel Diode and Schottky Diode. (Qualitative Treatment Only)

UNIT-III

Bipolar Junction Transistor: Transistor Junction formation, Current components and current flow in BJT, Ebers moll model, Transistor as a device in CB, CE, CC configurations and their characteristics, thermal runaway and thermal stability.

Biasing and Amplification: The operating Point, DC and AC load lines, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Voltage divider Bias, Stabilization, stabilization circuits, BJT CE Amplifier.

UNIT-IV

Junction Field Effect Transistors (JFET): JFET formation, operation & current flow, V-I characteristics of JFET, Pinch- off voltage of JFET, Parameters of JFET, JFET as Voltage variable resistor, Comparison between BJT and FET, Biasing of JFET.

UNIT-V

MOSFETs: Device Structure and Operation of MOSFETs, Enhancement & Depletion mode MOSFETs, current equation, V-I characteristics, DC-biasing, Analysis of CS, CD and CG amplifiers, MOS Capacitor. MOSFET applications: Switch, Digital logic gate and Amplifier.

Suggested Reading:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits”, 3rd ed., Mc-Graw Hill Education, 2010.
2. Robert Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th ed., Pearson India Publications, 2015.
3. Adel S Sedra, K C Smith and A N Chandorkar, Microelectronic Circuits: Theory and Applications, Oxford University Press, 2017, 7th Edition.
4. David A Bell, Electronic Devices and Circuits, Oxford University Press, 2008, 5th Edition.
5. Salivahanan.S, Suresh Kumar.N “Electronic Devices and circuits”, 3rd edition, Tata McGraw-Hill, 2012.

BS 251 CH	ENGINEERING CHEMISTRY LAB					
Prerequisite: Chemistry in Intermediate Program	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**	**Credits**
	L	**T**	**P**		**CIE**	**SEE**
	-	-	3		25	50	1.5

Course Objectives:

- To know the quality standards of potable water for health-based limits.
- To perform the routine synthesis of commonly used drug in the laboratory.
- Apply electrochemical principles in conductivity, Electrode potentials and verification of Beer' s law.
- To Evaluate Iron content from Iron ores.
- To Synthesize an extensively used polymer in industry.

Course Outcomes: After completion of this course, the students will be able to

1. Estimate the hardness of Water in various water samples.
2. Synthesize a small molecule drug.
3. Measure of conductance of solutions and redox potential.
4. Analysis of Iron content in Iron ore.
5. Synthesize an extensively used polymer in industry

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	1	-	-	-	-	-	1	2	2
CO2	2	3	1	1	-	-	1	-	-	-	-	2	2	2
CO3	2	2	2	2	-	1	-	-	-	-	-	2	1	2
CO4	2	2	1	-	-	-	1	1	-	-	-	2	3	2
CO5	3	2	1	1	-	1	1	1	-	-	-	1	1	2

List of Experiments

I) Water analysis.

1) Determination of Total hardness of water by EDTA method.

2) Determination of Permanent hardness of water by EDTA method.

II) Synthesis of a drug molecule:

3) Synthesis of Aspirin.

III) Colorimetry:

4) Verification of Beers law and Estimation of the given permanganate.

5) Verification of Beers law and Estimation of the given $CuSO_4$.

IV) Conductance measurements:

6) Determination of cell constant.

7) Estimation of HCl and CH_3COOH by conductometric titration.

V) Potentiometric Measurements:

8) Estimation of HCl by potentiometric titration.

9) Estimation of ferrous iron by potentiometric titration.

VI) Extraction of Iron from Hematite:

10) Determination of Iron in Hematite.

VII) Synthesis of Polymer:

11) Preparation of phenol-Formaldehyde Resin.

Suggested Reading:

1. Senior Practical Physical Chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)

2. An Introduction to Practical Chemistry, K. K. Sharma and D.S. Sharma (Vikas Publishing, N.Delhi)

HS 251 EG	COMMUNICATIVE ENGLISH LAB						
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	-	-	3		25	50	1.5

Course Objectives:

- To develop learners' pronunciation skills through an understanding of the English sound system, stress, and intonation.
- To enhance contextual and collaborative communication skills for academic, social, and workplace settings.
- To improve fluency, confidence, and interpersonal communication through interactive language activities.
- To develop employability skills required for interviews, group discussions, presentations, and professional interactions.
- To foster effective communication, teamwork, and lifelong learning skills are necessary for career growth.

Course Outcomes: After successful completion of the course, students will be able to:

1. Demonstrate correct pronunciation using the English sound system, stress patterns, and intonation in spoken communication.
2. Communicate effectively in various contexts using appropriate verbal and non-verbal communication skills.
3. Participate actively in collaborative communication activities, demonstrating teamwork and interpersonal skills.
4. Apply employability communication skills in interviews, group discussions, presentations, and workplace interactions.
5. Exhibit confidence, professionalism, and ethical communication practices for lifelong learning and career development.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	2	3	-	2	2	2
CO2	-	1	-	-	-	-	-	1	2	3	-	2	2	2
CO3	-	-	-	-	-	-	-	1	3	3	-	2	2	2
CO4	-	1	-	-	-	1	-	2	2	3	-	2	2	2
CO5	-	-	-	-	-	2	-	3	3	3	-	3	2	2

Unit I English Sound System

a. Sounds of English
b. Vowels
c. Consonants
d. Using Dictionary to decode Phonetic Transcription
e. Transcription exercise with the help of CALL (Computer Aided Language Lab)

Unit II Stress and Intonation

a. Syllable
b. Word-Stress and its importance
c. Intonation-Falling and Rising tone
d. Listening comprehension: Listening to various accents & Listening practice and exercises

Unit III Contextual Conversation Skills

a. JAM
b. Picture Perception
c. Public Speaking
d. Role plays: Use of dialogues in various situations like Social, Formal, Academic and Professional contexts.

Unit IV Collaborative Communication

a. Group discussion forms and techniques
b. Mock GDs
c. Factual GDs and Controversial GDs
d. Abstract GDs and Case Studies
e. Debate: Form, techniques, topics for mock debates in class

Unit V Employability Communication

a. Presentation Skills
b. Presentations with emphasis on visual aids and body language,
c. Interview Skills: Techniques
d. Frequently asked Interview Questions
e. Mock interviews, Simulator Technique

Suggested Readings

1. Vijaya B. Communicative English and Employability Skills – Orient Blackswan, 2026
2. T. Balasubramanian, A Textbook of English Phonetics for Indian Students. Macmillan,2008.
3. J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
4. Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata McGraw Hill, 2006
5. English for Engineers and Technologists (Combined edition , Vol. 1 and 2) Orient Blackswan 2010.

Suggested Software:

- Sky Pronunciation Suite
- K-van Software
- Study Skills
- English Pronunciation Dictionary –CALD

ES 251 CE	ENGINEERING GRAPHICS						
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	2	-	4	3	25	50	4

Course Objectives:

- Introduce the fundamentals of engineering drawing standards, geometrical constructions, conic sections, and engineering curves.
- Knowledge about AutoCAD software, coordinate systems, drawing tools, and basic drafting techniques for engineering graphics
- Develop proficiency in the use of AutoCAD commands for creating, modifying, dimensioning, annotating, and printing engineering drawings.
- Impart knowledge of engineering scales and orthographic projections of points, lines, planes, and solids.
- Enhance visualization skills for drawing sectional views of Engineering solids and for effective graphical communication of engineering concepts.

Course Outcomes: After successful completion of the course, students will be able to:

1. Apply the principles of engineering drawing to construct basic geometrical figures and curves using standard drawing practices.
2. Perform drafting operations using AutoCAD 2D commands to create, edit, dimension, and print engineering drawings.
3. Draw engineering scales and apply projection principles to points, straight lines, and various views of 2D and 3D objects.
4. Develop projections, sectional views, of regular solids, including prisms, pyramids, cylinders, and cones, in various orientations.
5. Demonstrate visualization and graphical communication skills using engineering drawing and CAD tools.

Course Articulation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	-	2	-	2	1	1	-	2	2	2
CO2	1	1	-	-	-	2	-	2	1	1	-	2	2	2
CO3	1	1	-	-	-	2	-	2	1	1	-	2	2	2
CO4	1	1	-	-	-	2	-	2	1	1	-	2	2	2
CO5	1	1	-	-	-	2	-	2	1	1	-	2	2	2

UNIT 1

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of

Drawing instruments, lettering.

Geometrical Constructions (General method only), Conic sections (General and special method); Cycloid, Epicycloid, Hypocycloid and Involute (line, triangle, square, circle, Regular Polygons), Construction of Tangent and Normal to all General methods of Conic sections, Cycloid, Epicycloid, Hypocycloid and Involutes.

UNIT 2

Overview of Computer Graphics: Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Drawings straight lines using various coordinate input entry methods, Applying various ways of drawing circles.

UNIT 3

Commands –initial settings, drawing basic entities, modify commands, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings. Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (Extend/Lengthen); Printing Options.

UNIT 4

Scales – Reduced and Enlarged scales, Representative Fraction, Problems - Plain, Diagonal and Vernier Scales,

Projections of Points – projection when placed in different quadrants

Projection of Straight lines – Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes.

UNIT 5

Projections of Planes – Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Projections of Regular Solids – Projections covering those parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Sections of Solids - sectional Views of Right regular solids covering Prism, Cylinder, Pyramid, and Cone

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, SciTech Publishers
5. S.N. Lal., Engineering Drawing (2018), M/s. Cengage Learning India Pvt. Ltd., Pratap Gunj, Delhi
6. CAD Software Theory and User Manuals.

ES 252 ME	WORKSHOP PRACTICE					
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation		Credits
	L	T	P		CIE	SEE	
	2	-	4	3	25	50	3

Course Objectives:

- To train students for identifying, selecting and use proper tools
- To Impart practical, hands-on skills in basic manufacturing processes and fabrication across multiple trades.
- To Instill a safety-first mindset regarding shop floor operations in an industrial environment
- To learn the fundamentals of house wiring which is used in daily life
- To Measure mechanical dimensions accurately using standard instruments like Vernier calipers and understand the working of modern manufacturing equipment.

Course Outcomes: After successful completion of the course, students will be able to:

1. Identify and select tools appropriate for specific manufacturing, assembly, and fabrication tasks across various engineering trades.
2. Fabricate physical products by applying hands-on skills in basic manufacturing and fabrication processes like carpentry, fitting, welding, foundry and other trades
3. Practice industrial safety by adhering to shop floor regulations, recognizing potential hazards, and using personal protective equipment.
4. Understand how individual trades work together to manufacture and assemble a complete engineering product and visualize the working of modern manufacturing equipment.
5. Perform precise measurements on machined or fabricated components using standard metrology instruments like Vernier calipers and gauges.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	-	-	-	2	1	-	2	1	-
CO2	2	-	2	-	2	-	-	-	3	1	-	2	1	-
CO3	1	-	-	-	-	3	2	2	2	1	-	2	1	-
CO4	2	1	2	-	2	-	1	-	3	2	1	2	1	-
CO5	2	1	-	2	3	-	-	-	2	1	-	1	1	-

LIST OF EXPERIMENTS:

1. **Carpentry shop**
   - Making of Cross lap joint with Wood
   - Making of End Lap /Tee Lap Joint with wood
2. **Fitting shop**
   - Making of Step cut with Mild Steel flat
   - Making of semicircular and V-cut with Mild Steel flat
3. **Sheet metal shop**
   - Making of Funnel with GI Sheet
   - Making of Rectangular box with GI Sheet
4. **House wiring**
   - Making of Cleat wiring
   - Making of casing wiring
5. **Welding shop**
   - Making of Butt joint using Arc Welding
   - Making of Lap Joint using Arc Welding
6. **Machine shop**
   - Making of Step turning on MS cylindrical rod
   - Making of Taper turning on MS cylindrical rod
7. **Foundry shop**
   - Preparation of casting using single piece pattern
   - Preparation of casting using core pattern
8. **Smithy shop**
   - Forging of square shape peg from cylindrical workpiece
   - Forging of square shape L- bend peg from cylindrical workpiece
9. Demo of advanced manufacturing equipment
   - CNC Machine / Injection Molding / FDM 3D Printer

Note: Minimum six trades should be conducted.

Suggested Reading

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Element of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.